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EDITORIALS

The report on the examination of the Maxwell car which made the trip from coast to coast and back again makes a fitting sequel to the article published in last month's issue of "Lubrication" on the "Seal Theory." When the article was published last month the car had not yet been torn down for examination, and the arguments to substantiate the "seal" theory were based upon the manner in which the car operated and upon a comparative test of a sample of new Texaco Motor Oil Medium and a sample which had been placed in the car at Dallas, Texas, and had been used

for 2,000 miles. The report of Mr. Lipsner, in which he gives a careful and minute description of all lubricated parts as they were found after the car was dismantled, pays an eloquent tribute to Texaco Motor Oil. While it happens that Motor Oil Medium was the oil particularly suitable for this car, similar results would have been obtained had the car been in such a condition that Motor Oil Light, Motor Oil Heavy, or Motor Oil Extra Heavy had been the lubricant suitable for the experiment.

At this season of the year when many farmers have experienced with mingled feelings the effects of neglecting their farm machinery during the fall and winter months, the article published in this month's issue on the care and preservation of farm machinery is particularly apropos. As soon as agriculturists generally come to realize the value of Texaco Crater Compound for the lubrication of farm machinery they will not only find that they have solved their lubricating difficulties but also that they have taken a great step toward the reduction of noise and wear while the machinery is in use and of rusting and deterioration while the machinery is in storage during the winter months.

REPORT ON THE EXAMINATION OF THE MAXWELL CAR WHICH MADE THE TRIP FROM COAST TO COAST AND BACK AGAIN

By Mr. B. B. LIPSNER

Supervisor of Motor Equipment, The Texas Company, Chicago

THE Maxwell car which made the trip from coast to coast and back again, a distance of 9,615 miles, was disassembled at the Maxwell Service Station in Newark, N. J., on March 6, 1917. Two hours and thirty-five minutes after the work was started, all parts were laid out on a bench, and the following points were noted.

Spark Plugs—The spark plugs, which had been used throughout the trip, showed no signs of excessive carbon (See Figure 8.) The adjustment was correct with the exception of No. 4, the center electrode of which was slightly burnt, necessitating that the ground portion of the plug connection be forced over to meet the center electrode to make the correct clearance.

Intake Valves—The heads of the intake valves showed an accumulation of what appeared to be a mixture of heavy-end gasoline and over-

lubrication. The under side of the valve head showed no scale, and the stem was true and accurate (See Figures 6 and 8).

Exhaust Valves—The exhaust valve heads were slightly sooty, but this was very easily removed with a dry rag. The valves in general showed no signs of lack of lubrication, and no scale whatever. The face of the valve showed no ridges, rings, or pits. These are the finest set of valves that I have ever seen taken from a motor, taking into consideration the fact that the car had made a journey the length and difficulty of which was described in the March issue of "Lubrication."

Cylinder Head—The detachable head, which forms a part of the combustion chamber, was devoid of any excessive carbon, the accumulation being of a nature similar to that noted on the exhaust head valves, except that there was much more of it. The gasket which was

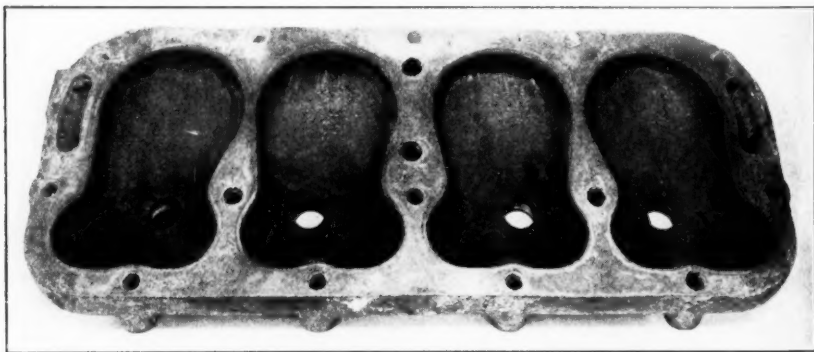


Figure 1—Detachable Cylinder Head

An excess of carbon would cause preignition and would greatly impair the power plant. Only a negligible accumulation will be noted.

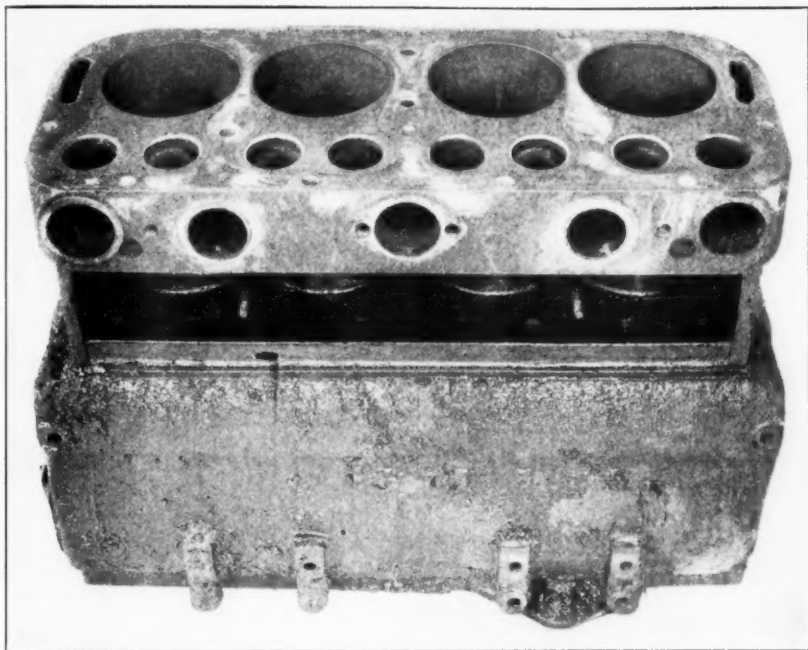


Figure 2—Cylinder En Bloc

The cylinder bores possessed a mirror finished surface.

inserted between the top of the cylinder block and the detachable head was in perfect condition.

Cylinder En Bloc—To the naked eye the cylinder block appeared in excellent condition with the exception of bore No. 2, which showed a severe scoring .015" deep and $3\frac{1}{8}$ " long. This was caused, while en route, by the fact that the retaining stud which holds the small end of the connecting rod to the wrist pin backed off because of vibration, and twisted the wire which is inserted in the head of the stud, thus allowing the case-hardened wrist pin to cut into the softer metal of the gray iron block. When driver Scull discovered this condition he immediately made arrangements to have the wrist pin securely tightened. However, with the wrist pin in this condition the car had covered at least 50 miles.

In this connection it should be noted that in spite of this deep twin score the sealing properties of the Texaco Motor Oil were such as to prevent an excessive leakage of gases past the rings. The spark plug or the valve cap gave no indications of any leakage. This is a rare occurrence, as it is customary, when injured cylinders exist, for the spark plugs as well as the valve caps to be flooded with oil. The valve seats were found to be in especially fine condition. In fact, if a very light coat of emery and oil had been used for a few minutes an expert mechanic would have been unable to say that these valves had been through such a grueling test. Valves and seats, as a rule, show just as readily as the head of the piston or the piston grooves when an inferior lubricant has been used.

Pistons—The pistons were next

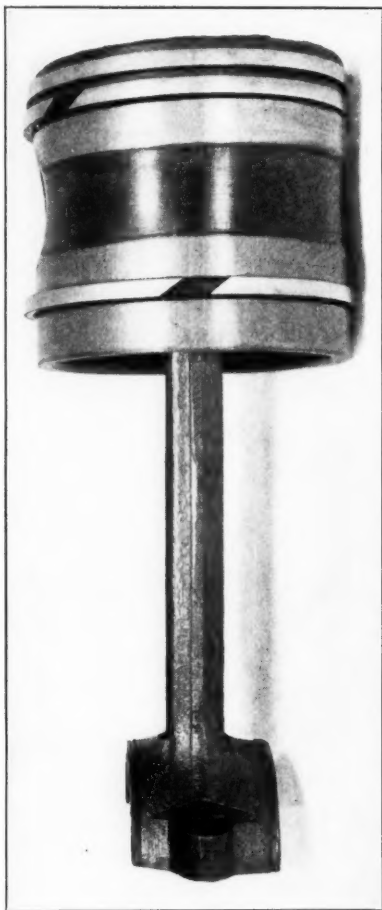


Figure 3—A Piston and Connecting Rod

The splendid condition of this piston and connecting rod is proof of perfect lubrication.

observed and found to be in excellent condition, with the exception of No. 2, which showed, on the under side of the skirt, a slight discoloration, denoting the passing of vapors, although, as previously mentioned, the valve cap and the plug gave no indication of such a condition. The deposits in the piston grooves, especially in the top groove, were of a hard, flinty nature, intermixed with a soft and sooty deposit.

Competitive gasoline was used part of the way on the return trip, and inasmuch as these deposits are different from those left by Texaco products, it may be assumed that this condition was due to the competitive gasoline. The lower piston grooves, however, did not have nearly as much carbon, and the deposit was of an entirely different formation, being soft and sooty.

The heads of the pistons did not show an excessive amount of carbon, but the formation was of various descriptions (See Figure 6). There were heavy layers and thin layers; there was soft carbon and hard carbon. It can easily be seen why this was the case when it is borne in mind that this car had journeyed through deserts where the silica and dust were carried through the intake of the carburetor into the combustion chamber.

Piston Rings—Each and every ring removed from the pistons was in a practically perfect condition; every one possessed the usual amount of flexibility, there was no trace of any fine scratches, and the inner portion of the ring showed a very slight and hard deposit.

Main Bearings—The Maxwell car in question is of the two main-bearing type. The upper part of the front main bearing was in a very fine condition, while the lower portion showed slight wear. This also applied to the rear main bearing. I learned from Messrs. Scull and Tuthill that while they were in San Francisco and prior to their return journey they had a mechanic refit this bearing. The work was done under peculiar circumstances, and as a result the two halves were not properly fitted to the shaft. Examination showed that the shaft was really rotating on several wide high spots. In spite of this, the actual

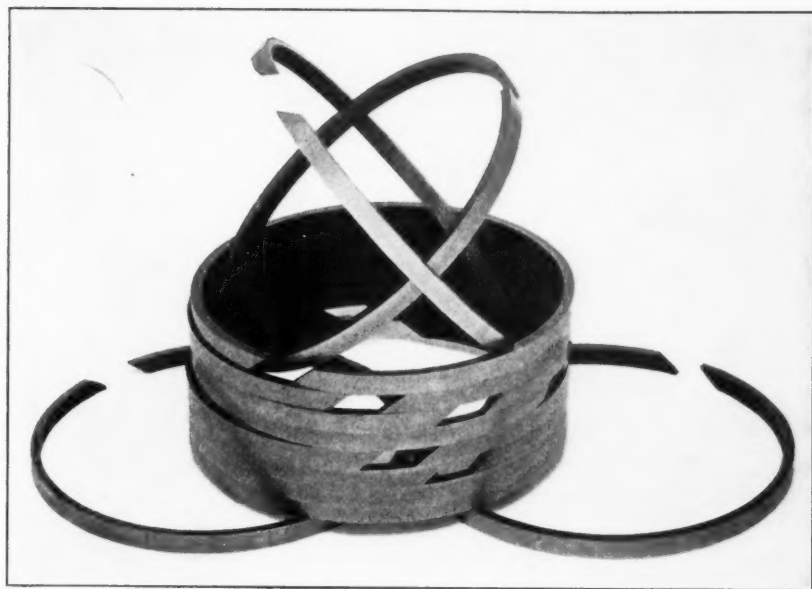


Figure 4—Piston Rings

Each piston is equipped with three rings. All twelve are shown above. Not a single ring showed signs of passing gases, was cracked or scratched, or lacked flexibility.

wear was practically negligible, just the slightest movement up and down being felt before the shaft was taken out of the motor.

In this connection I would like to state that I drove this car before it was taken down, and the power and speed shown were remarkable. The ride occurred just after a heavy fall of snow which made it necessary to force the car through mounds of snow. Not a knock of any description was discernible, and it must be remembered that this car had not been touched for seven thousand miles.

Connecting Rod Bearings—The lower end of rod bearing No. 2 was fractured between the two oil grooves, although when the parts were placed together there was absolutely no sign of bearing wear. This was due to the fact that the oil grooves were cut too deep. The wrist pin bushings were worn only slightly. The wire used in the re-

taining studs on rods Nos. 3 and 4 for the purpose of holding firmly the upper end of the connecting rod to the wrist pins, and which is inserted for the purpose of preventing the retaining stud from backing off, was found in the sump of the crank case.

Crank Shaft—The main journals and crank pins, upon close examination, showed no signs of wear. They were all slightly out of round, but the surfaces were smooth and showed no signs of abrasion, wear, or ridges of any description, or of having been subjected to such extreme usage.

Cam Shaft—The raised portion of the cam shaft, sometimes referred to as the nose or contour, was observed to be in a perfect state, there being absolutely no signs of wear.

Valve Tappets—That portion known as the cam follower, which rides upon the nose of the cam or the cam contour, was also in perfect

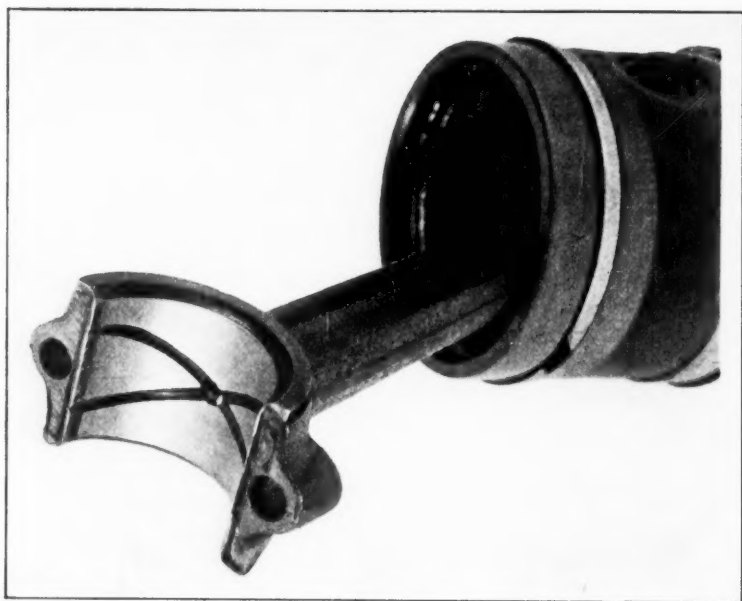


Figure 5—Connecting Rod Bearing (Upper Half)

The splendid surface of this rod bearing can be appreciated only when one stops to consider that it has revolved on a crank pin for millions of revolutions. This shows what severe conditions a Babbitt bearing with a low melting point will stand if only the correct lubricant is used.

condition and did not show any signs of wear, nor did the valve plunger guides. It must be remembered that this is one portion of the mechanism that is subjected to continual taps, and is also subjected to severe angular pressure. In past experiences I have noted many instances where wear could easily be discerned.

Transmission—The transmission gears, both counter-shaft and sliding shaft gears, showed no appreciable wear of any description, although the edges of the teeth indicated a trace of gear clashing. It should be remembered that the drivers were operating this car under very difficult conditions, as it was necessary in many instances to shift rapidly from high to intermediate speed and also from high to low speed. No matter how expert one may be in the operation of an automobile, he cannot help

clashing gears under such conditions. Upon close examination I could easily distinguish all of the gear cutting marks on the face of the teeth, proving conclusively that wear, even in a slight degree, had not taken place. There was a slight play on the spine shaft of the sliding gears, caused by the winter run through the South. Mud from six to twelve inches deep was encountered for practically the last 2,000 miles, and it was necessary to run for long distances in first and second speed.

The most conclusive lubricating performance that I have ever witnessed existed in this particular instance. A misplaced washer had allowed most of the Thuban Compound to leak out, and the amount of Thuban remaining in the transmission case was approximately four ounces, which would allow the large gear to dip only $\frac{1}{4}$ inch while

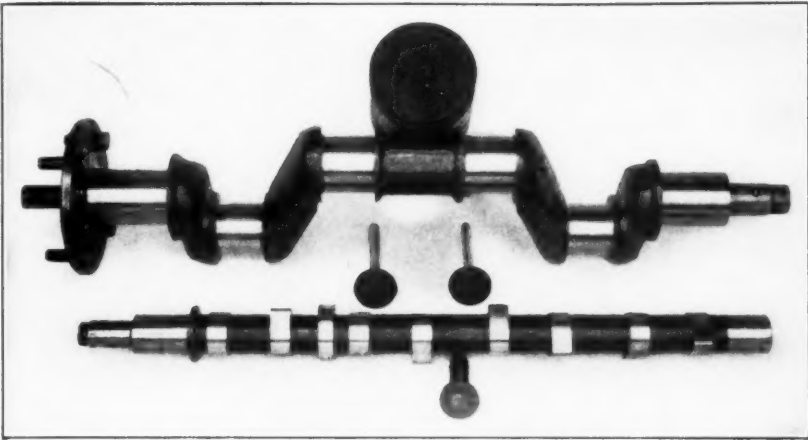


Figure 6—Crank Shaft, Cam Shaft, Piston Head and Valves

standing still. If it were not for the adhesive qualities of Thuban Compound one could hardly imagine how these gear teeth could have been preserved under such severe conditions. I was informed by Mr. Scull that the last time the transmission case received any attention was in Dallas, Texas, which is approximately 2,200 miles from New York by road, where enough Thuban was put in to cover the shaft. This car was also used for no less than three weeks after the return in demonstrating to prospective Maxwell users around Newark, N. J., and all during that time this small quantity of Thuban Compound answered the purpose. Even with this small amount of Thuban Compound in the transmission case, there was a *very thick coating of the Thuban Compound on the gear teeth*, and when the transmission was photographed, I had to use extreme care in washing off each individual tooth so that the photographer could produce a clear picture of the gear teeth.

Differentials—Upon examination of the rear axles, a very small amount of Thuban Compound was found therein, and upon close

examination of the Bevel and Pinion gear it was found that each individual tooth was in the finest possible condition, denoting that lubrication was sufficient at all times.

Another interesting feature was observed when the clutch thrust bearings were examined. Each ball was found to be in a state of perfect preservation, with no abrasions of any description. The race-ways were perfectly smooth, with the exception of a slightly polished surface which it would be only natural to expect. In view of the insignificant amount of lubricant which was in the clutch case, I wonder that a lubricant can be made of such adhesive and durable quality as to prevent the thrust bearings in question from being destroyed. Every time the clutch was disengaged the bearing in question was subjected to extreme frictional resistance, and it is very necessary for a lubricant to interpose during these periods.

Wheel Bearings—Each and every wheel bearing was found to be in A No. 1 condition, there being practically no wear.

Magneto—A word might be spoken of the Simms Magneto with which

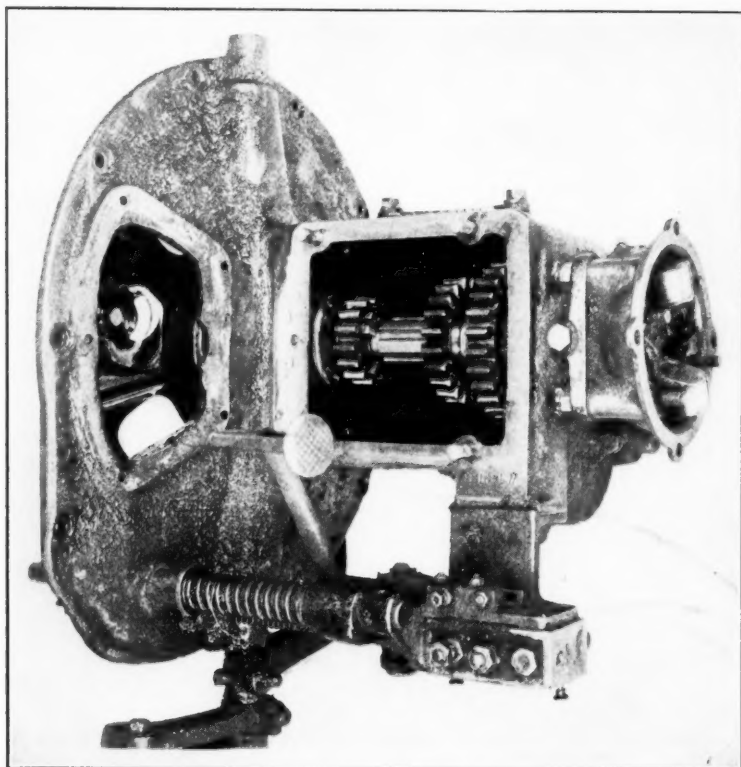


Figure 7—Transmission Gears

One glance at the condition of the above gears will remove the slightest doubt as to the lubricating qualities possessed by Thuban Compound. Every original tool cutting mark is easily discernible.

this car was equipped. With reference to the distributor plate, the segments were in perfect condition. The make and break, or interrupter points, sometimes referred to as platinum points, were adjusted slightly too close. The carbon brushes, particularly the one that comes in contact with the armature collector ring, appeared like new. I questioned Mr. Scull as to whether this carbon brush had been changed, and he informed me that it had not. The armature bearings were in perfect condition; the magnets were strongly magnetized; in fact, the entire magneto was as good as new.

In conclusion I might say that I have had an opportunity to analyze

the manner in which Mr. P. G. Scull operates an automobile, and to say that he expects a great deal of a car is putting it mildly. That he realizes these expectations is evidenced by the fact that the car was driven from Newark, N. J., to Los Angeles, three thousand four hundred and fifty miles, in the actual time of ten days and two hours, the running time being six days and two hours. From what I observed and from what I have learned from Mr. Tuthill and others, I am safe in saying that this car was put through some very severe driving by Mr. Scull, the idea being, "The car will do it, here goes." Certainly this car's run more than equaled three

years of driving by an ordinary motorist.

Our products have been put through one of the severest tests that I have ever witnessed, and the accompanying photographic reproductions of the specimens as found upon the disassembling of the

various units pay an extraordinary tribute to the quality and the lubricating value of Texaco lubricants. The parts shown in the illustrations were not altered in any way, but were photographed in the condition in which they were found when the car was disassembled.

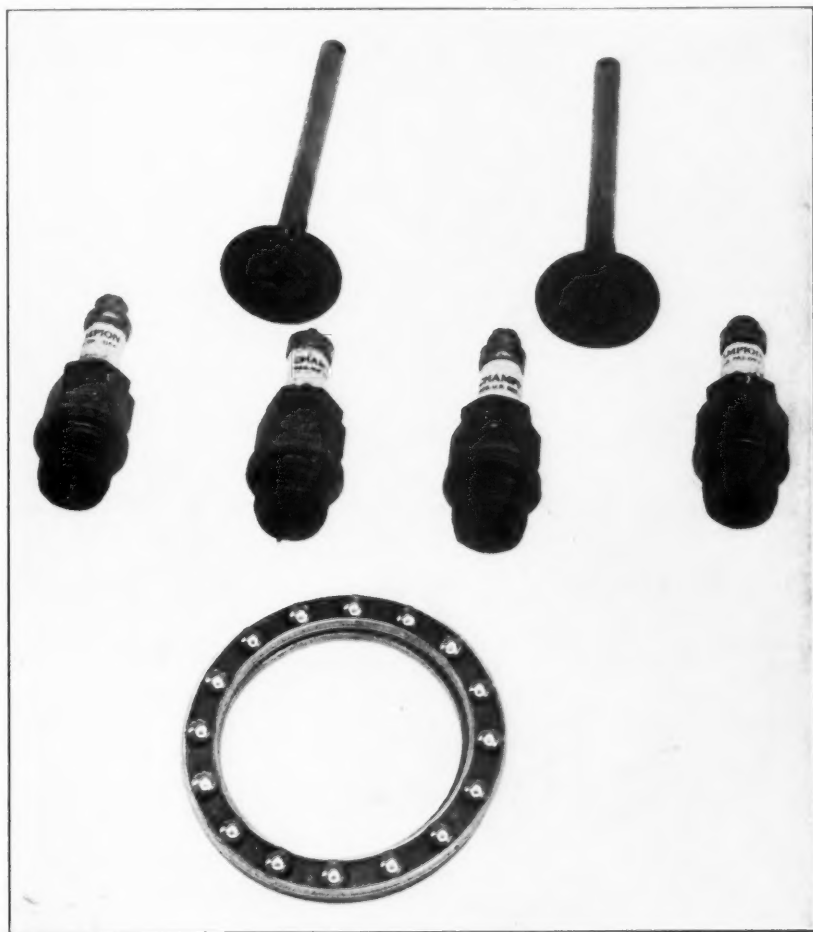


Figure 8—Clutch Thrust Bearing, Valves and Spark Plugs

In spite of the small portion of lubricant found in the thrust bearing, not a single ball was injured, nor were the race-ways in any way distorted with the exception of slight natural wear. The petticoat portion of the porcelain of the spark plug was exceedingly clean. The clearance between center electrode and ground portion of meter wire was correct. Only a very light coat of soot was found on the exhaust valve. The valve stems were true. A very slight formation of carbon deposit was found on the intake valve, and this was very easily removed. No scale of any description was found on either intake or exhaust valves.

CARE AND PRESERVATION OF FARM MACHINERY

THE American farmer has been charged with being the most neglectful of all farmers in the world regarding his farming equipment. It has been too truthfully stated by many observers that our American farmer will unhitch his horses and leave his costly machines out in the fields, exposed to the weather and to the corroding influences of rain, snow and sun until the next season.

The United States Department of Agriculture, taking notice of this fact, issued in 1912 Bulletin No. 504, dealing with the care of farm machinery. A quotation from this bulletin, compiled from the Colorado Station Bulletin No. 167, reads as follows:

"To properly care for the farm machinery means that it must be well selected, kept in good repair and adjustment, oiled thoroughly, cleaned before housing, and it must have all wearing parts well greased when not in use, and painted when necessary, and it must be properly housed.

"At least one-half of 'good care' consists in keeping the machinery properly repaired, in good adjustment, and thoroughly oiled when in use. To neglect any of the lines of care mentioned, means serious damage and loss to the machine."

The Bulletin further states:

"If this be true it must be evident to any observant person that only a very small percentage of the farmers of the country properly care for their machinery. More give machinery good care when in use than properly care for it when not in use."

"Whether the machinery is to be housed or not, it should be cleaned and thoroughly oiled at the end of the season."

The life of all farm machinery can be greatly increased if proper

care is taken in regard to lubrication. The manufacturers of farming implements have done all that they could in designing their bearings, supplying grease cups where possible, enlarging oil ways and arranging small baths for gears to dip in. They have gone as far in this direction as the manufacturers of any other class of similar machinery, and have done more than the designers of looms or other machinery of a like nature, which is, relatively, of the same degree of construction as far as exactness and weight are concerned. Their instruction books have been very carefully compiled and the subject of lubrication has been dealt with to a considerable extent.

Nevertheless, the expert observers that we have had working on the subject of lubrication of farm machinery during the past year have reported that great piles of junk exist in all localities where farming machinery is used to any considerable extent, and this junk consists mostly of gears, sprocket wheels, chains and bearings that have been wholly or partly worn out, due to imperfect or improper or an absolute lack of lubrication. It is not necessary to seek far for the cause. Most of the bearings, practically all of the gears, sprocket wheels and chains of all farm machinery are comparatively lightly constructed. Where the efficiency of the entire machine depends upon some one bearing or series of bearings, these bearings are so constructed that it is necessary to oil them, according to instruction books, at least once per hour. In the case of the mower, for instance, the Pitman connection to the knife head is the most important

operating part of the mower. This is similar to an engine connecting rod. The box that works over the crank pin is of universal joint design, so made that it can operate after being somewhat out of line. Much thought has evidently been given to this construction. In one design, the builder states, an oil chamber is provided, which holds enough oil to keep the box lubricated for several hours. One manufacturer's agent recently showed us one of these parts that had been worn completely through so that the machine was out of commission. The same agent stated that this part gave them a considerable amount of trouble and constituted a very large proportion of their repairs.

The trouble with the lubrication is not due to the fault of construction, as the designer seems to have done all that was possible, but, as shown in his instructions, he only had space available for oil that would allow running for several hours. The difficulty seems to have been that the operators would not stop the machine at frequent enough intervals for re-oiling, or the oil used was of such a light body that under the heat in the open field it would become so thin as to run out, requiring oiling oftener than during cold days, or with a heavier oil.

In any event, it is a straight lubricating proposition which can be solved absolutely with Crater Compound. Proof of this statement is contained in the following letter received from Mr. Herman Peiter, Southport, Conn., which reads as follows:

"I have tried Crater Compound on the gears of a Buckeye Mower with perfect satisfaction. The gears run quite noiselessly even on a worn machine and keep oiled far longer than with any thin oil.

"One of my neighbors put it on a Walter A. Wood Mower, and used the machine a whole week without re-oiling. Previously, he would oil it up about every hour when he used a thin oil.

"Another neighbor used it on a Buckeye Mower, a machine so badly worn that he laid it aside last year as having outlived its usefulness. The Crater Compound made it work almost as smoothly as a new machine.

"I shall use it on a disc harrow and the gauge wheel of a walking plow, and from my experience with the other implements I am positive it will also prove most satisfactory on these.

"I tried it on the rack and pinion of a hand force pump, and believe me, it made the work of pumping much easier.

"I now have no doubt that Crater Compound will prove superior to any other lubricant on the gears and chains of farm machinery such as mowers, reapers, tedders, manure spreaders, etc., also pump jacks.

"I appreciate very much the opportunity you gave me to test this useful material."

Not only is Crater Compound of the greatest value for the lubrication of farm machinery generally where it can be used on practically the entire machine, but its greatest value is undoubtedly to be secured from its use as a protective agency. All of the wearing parts can be painted with Crater Compound at the end of the season, and these wearing parts then do not have to be removed. The machine can be left in the open if necessary, and all parts so protected by Crater Compound that they will be in perfect condition the next season.

The mould boards of plows and the blades of cultivators and disc harrows should be greased with

Crater to prevent rust when laid away for the winter. Also, every nut and bolt should be removed from every farm implement, the threads coated with Crater Com-

pound, and the nuts replaced. If every farmer would do this, just think what a lot of perspiration, skinned knuckles and profanity it would save.

TEXACO PRODUCTS

WIRE rope is not so simple a thing as its name would imply. As the superintendent of a large wire rope company recently remarked, it is a marvelous machine, and deserves careful consideration. Far from being a bar of inert steel it is a thing always in motion, and in that motion lies its strength. Heavy strains must be met and wear must be equally distributed.

This constant motion means internal friction, a condition which calls for intelligent lubrication. This is a vital matter, as the life of a rope can be greatly prolonged by an understanding of its needs. Much depends upon the initial lubrication, that is, the lubricant which is used to lay up the hemp core around which the strands of the rope are wound. This lubricant should not only retard the effects of friction, but should also act as preserver of the rope and prevent internal destruction due to corrosion caused by contaminated water penetrating to and soaking the core. This chemical action eats away the wires and decreases the tensile strength of the rope. Very often a rope, which appears on the surface to be in perfect condition, will fail, and an examination of the interior will disclose wires worn to a needle-like point from lack of internal lubrication and corrosion. Sudden and unexpected breakage is, of course, very dangerous, not to mention expensive.

When a rope is properly lubricated from the inside, less lubrication

is necessary from the outside. That the result may be uniform and thorough one lubricant should be used throughout. Sometimes a good external lubricant will not penetrate because of an unsuitable material used internally.

Our engineering department investigated the wearing or bearing surface on one hundred feet of wire rope one inch in diameter, which they found to be about 334 square feet. They then made a careful measurement of all of the bearing surface of a 35,000 h. p. Reversing Engine (one of the largest in the world), and found that there was 319 square feet, actually less than that in the 100 feet of one inch rope. And yet the wire rope often receives very little attention in the way of lubrication. It is remarkable how long the rope will last when it receives so little attention. Think how much more durable it can be made by the use of a proper lubricant, such as Crater Compound, which has been proven time and time again to be the most excellent wire rope lubricant known.

"The superintendent of a large stone crushing plant in my territory advises me that they have been renewing their gears, at a cost of \$128 each, every six months, that since the installation of Crater Compound they have not had to replace a gear in eight months, and that there is no immediate prospect of having to do so for some time to come."

(Signed) T. L. ROBERTSON.